Tutorial
H-1000-5326-01-A

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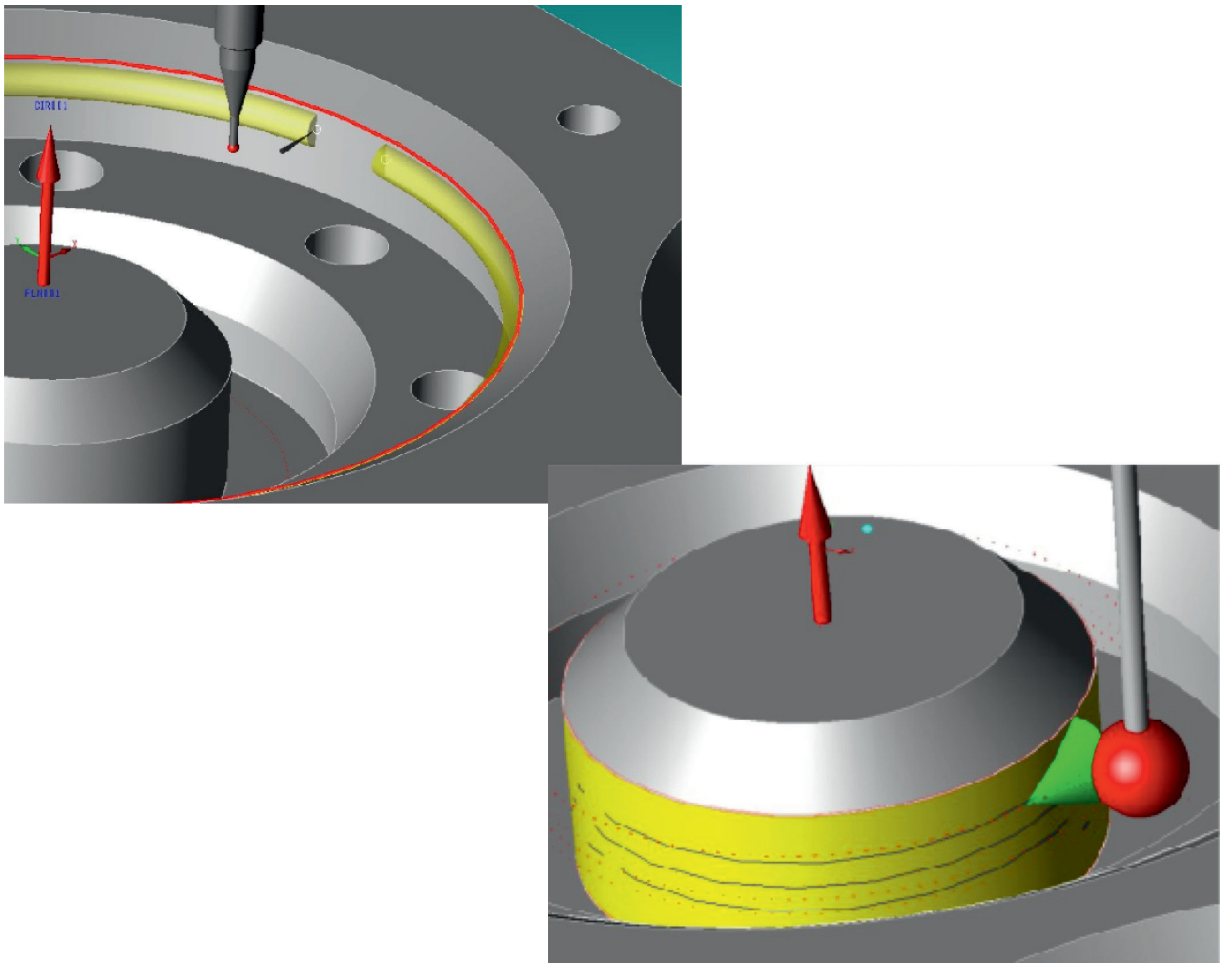
Bore / boss scanning using all 5-axis techniques (CAD)



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Bore / boss scanning using all 5-axis techniques (CAD)

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Contents

1 Bore / boss scanning using all 5-axis techniques (CAD)

1.1 Tutorial pre-requisites

- The student should have completed the ‘Introduction to 5-axis measurement and movement techniques’ tutorial

1.2 Tutorial objectives

- Understanding tool selections with specific 5-axis optimisation vs. metrology integrity considerations
- Introduction to various methods of circular feature measurement and scan path definition methods

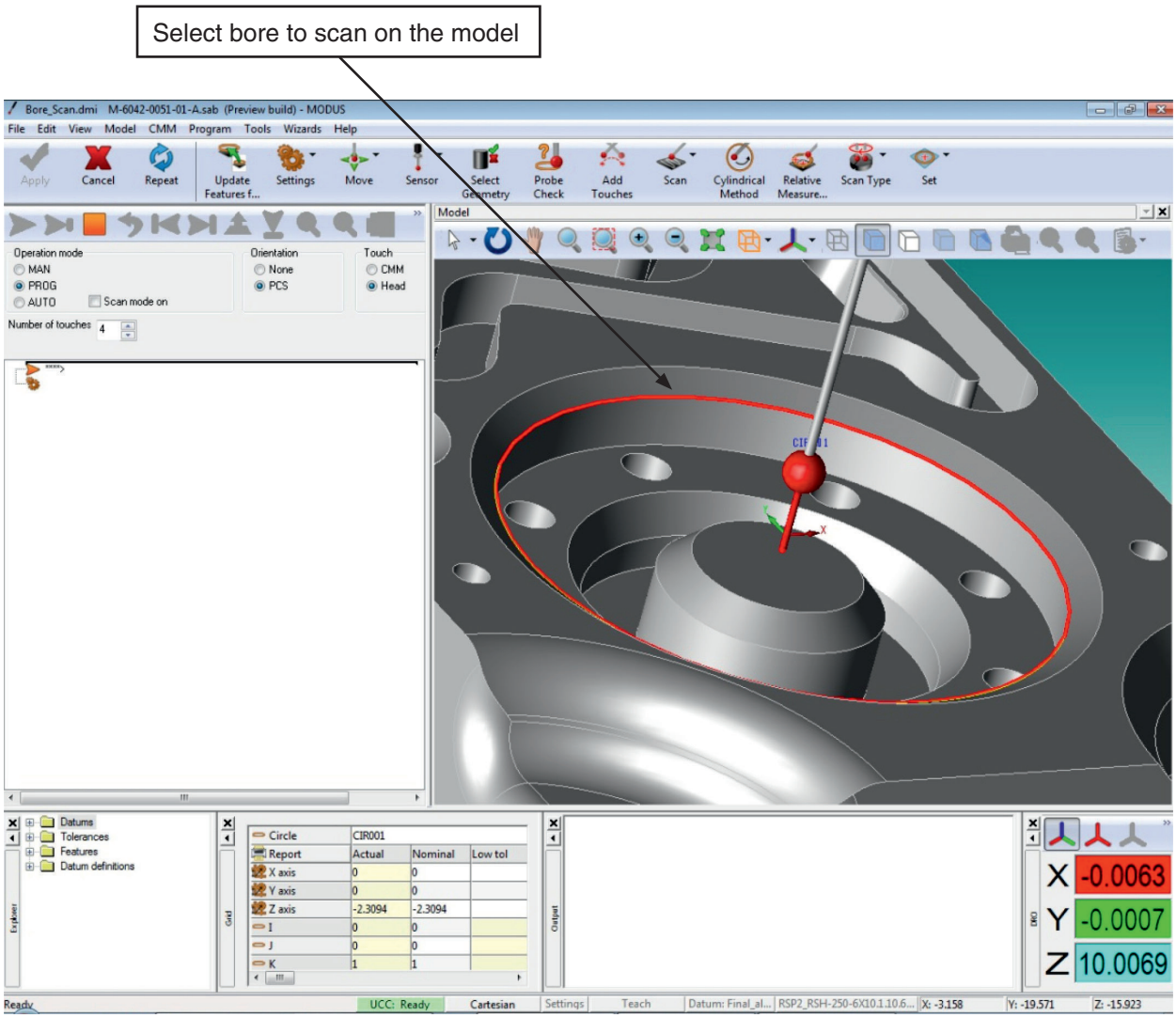
2 Introduction

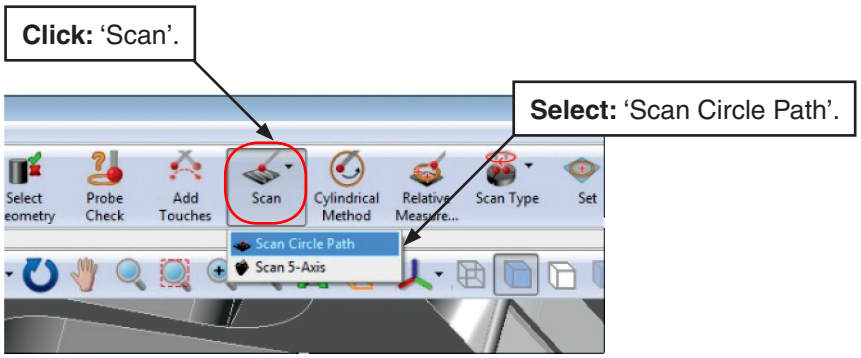
This tutorial further explores scanning techniques that can be employed for circular features. Particular attention is paid to probe paths definition and manipulation with a view to optimise scan speed whilst maintaining metrology integrity.

3 Internal bore measurement using 5-axis scanning techniques

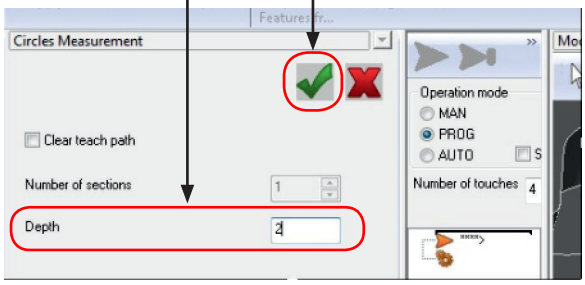
Before commencing with this tutorial the component should be precisely aligned as previously described.

The internal bore can be scanned by using a circular path as follows:

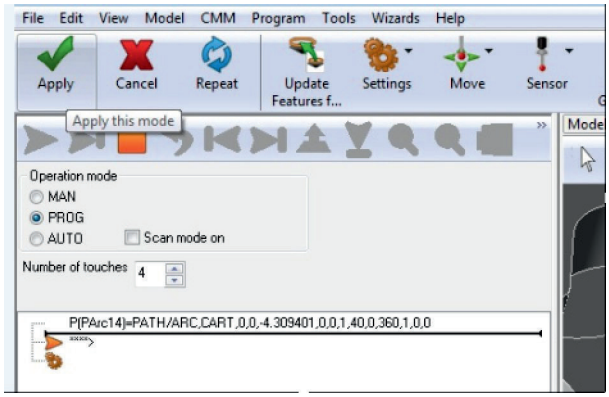




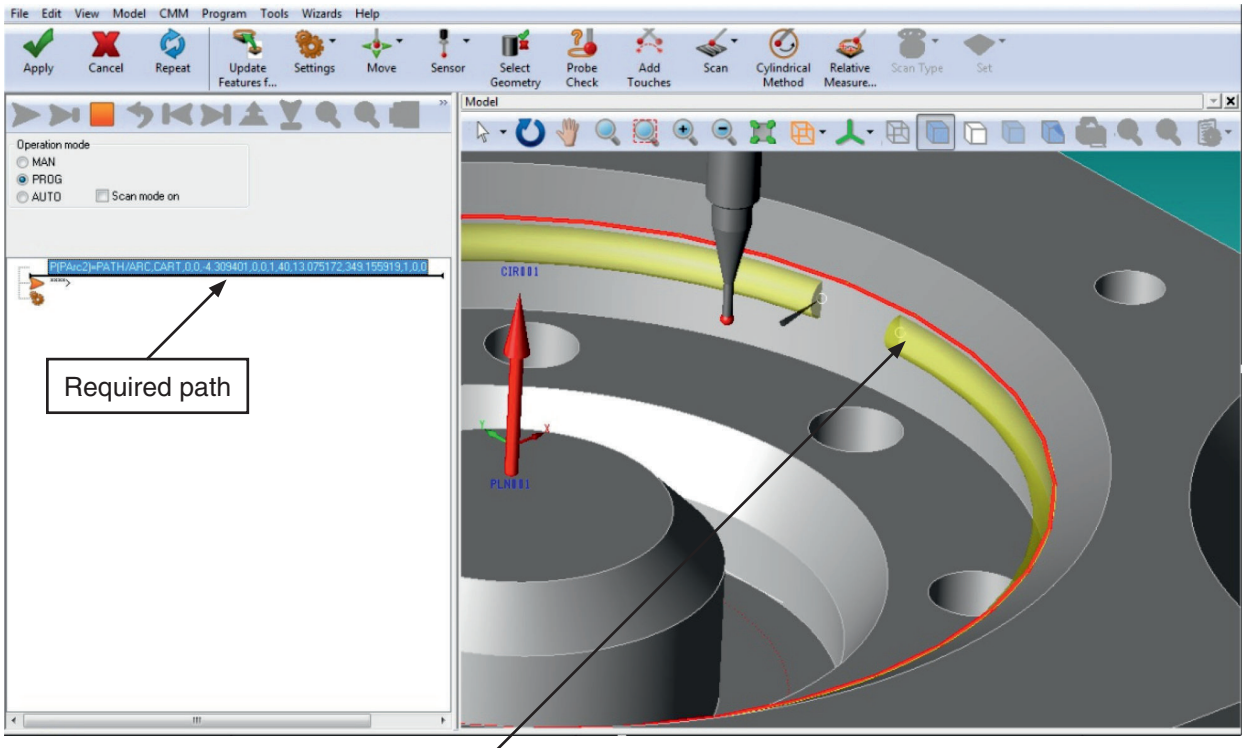
Select required depth from feature nominal then click the ‘GREEN TICK’ to continue.



Scan path has been added to teach path view:



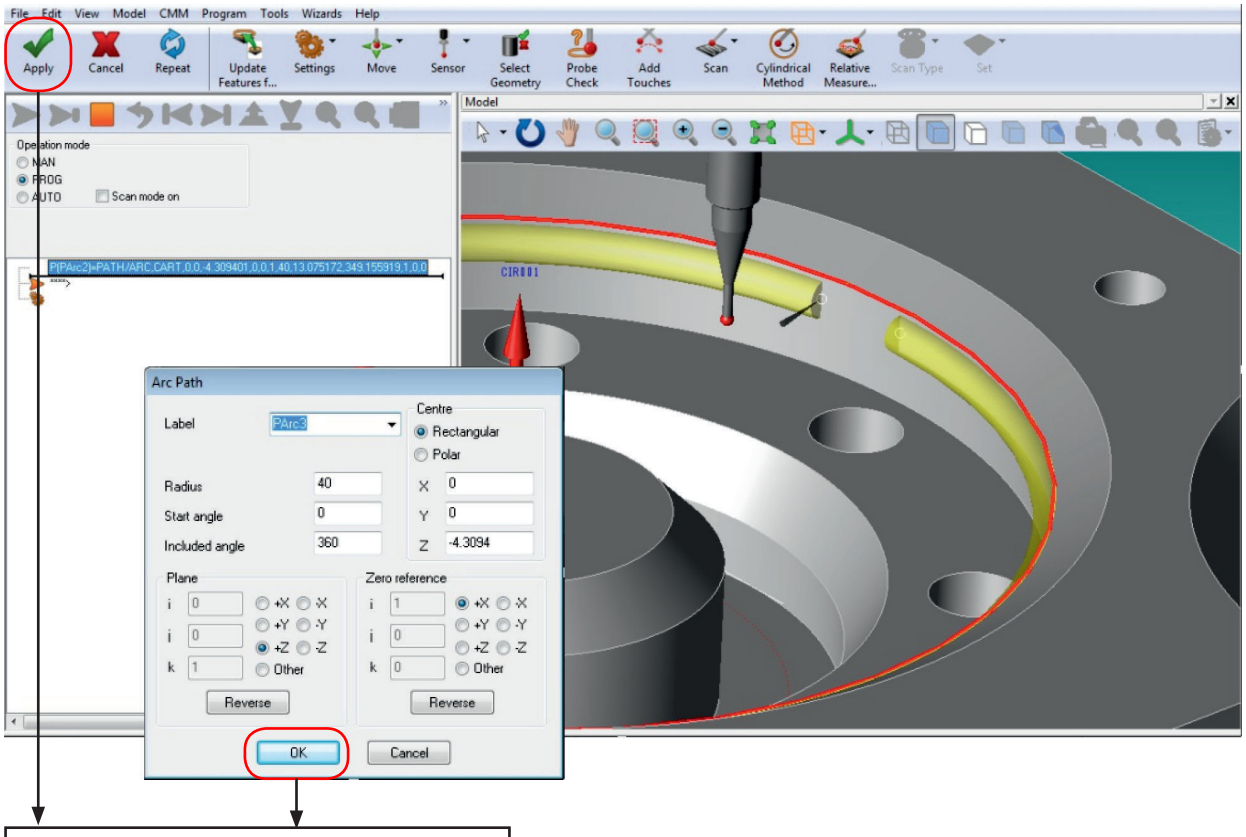
At this point it is possible to manipulate the scan path to make any necessary changes (i.e. start, end points). Single left mouse click on the required path. This highlights the scan path and handle markers:



To move to the desired location, hold down the left mouse button over the handles.

An alternative method of scan path manipulation is to double left mouse click the required path.

This brings up the ‘Arc Path’ dialogue box. From here enter any desired amendments.



Click: ‘OK’.

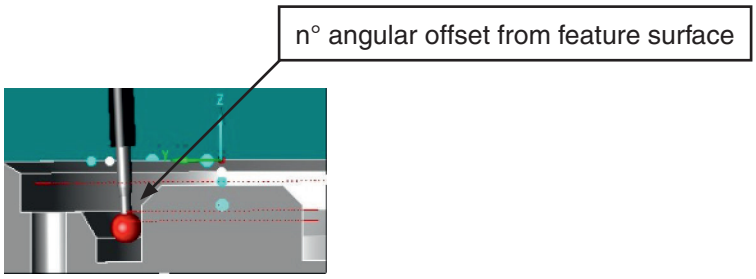
Click: ‘Apply’ to carry out measurement.

4 Scan of bore using cylindrical method

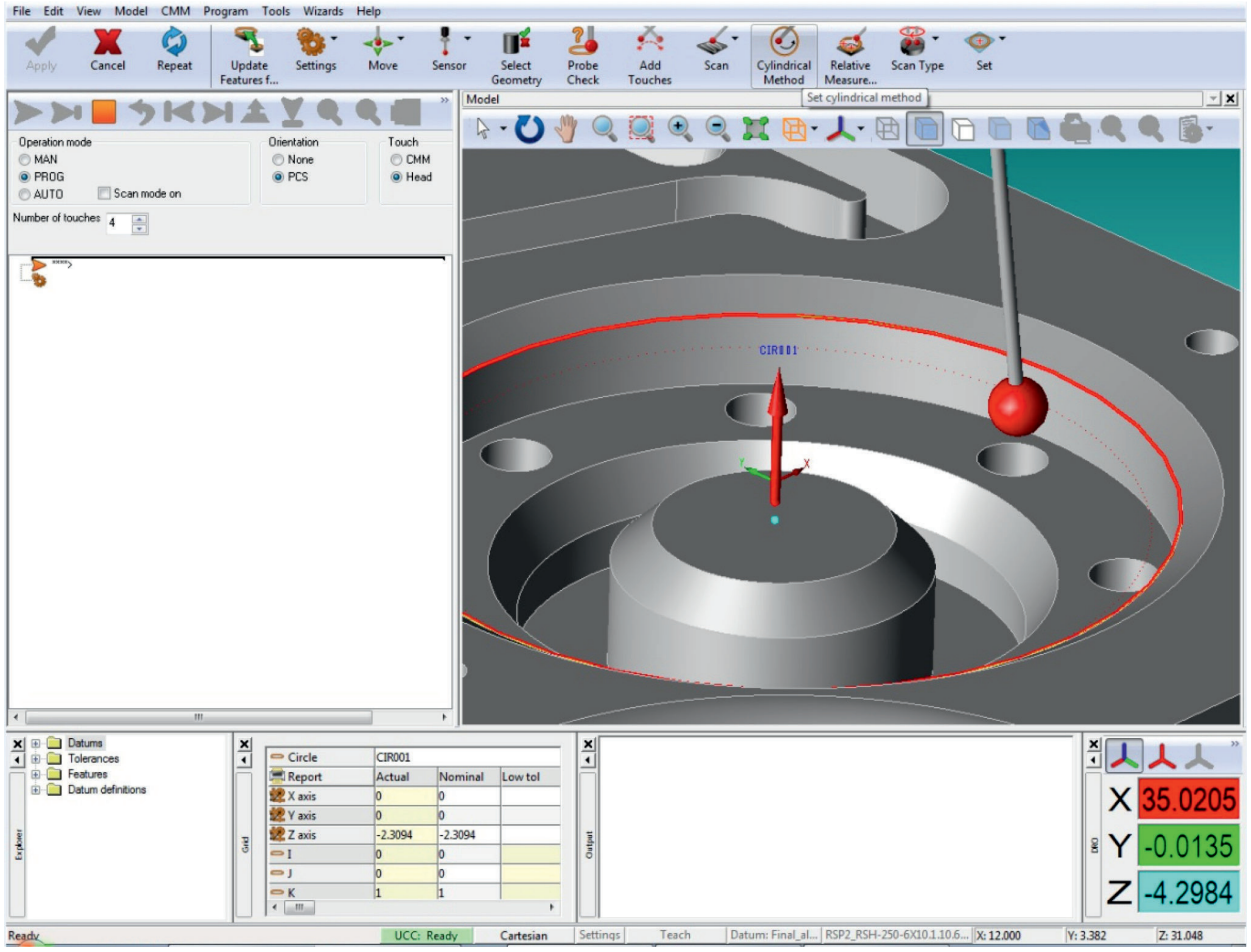
'Cylindrical Method' is used to define the probe and probe head orientation when scanning a feature.

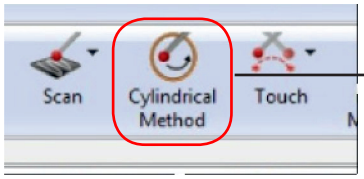
The options allow definition of the appropriate clearance angle between the stylus and feature to be scanned. This option must be used for large internal bores resulting in a 5-axis scan.

For further information on 'Cylindrical Method' refer to MODUS help (F1).



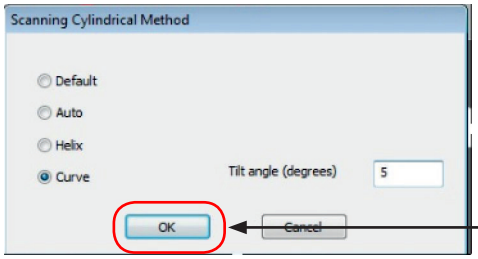
Select the required bore to scan on the model:





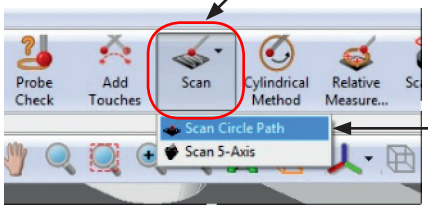
Select: 'Cylindrical Method'.

Within the ‘Scanning Cylindrical Method’ dialogue box select / input required options:

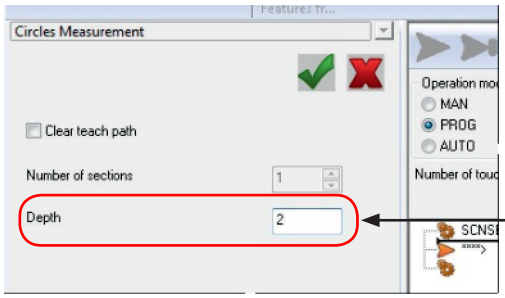


Click: ‘OK’ to continue.

Click: ‘Scan’.



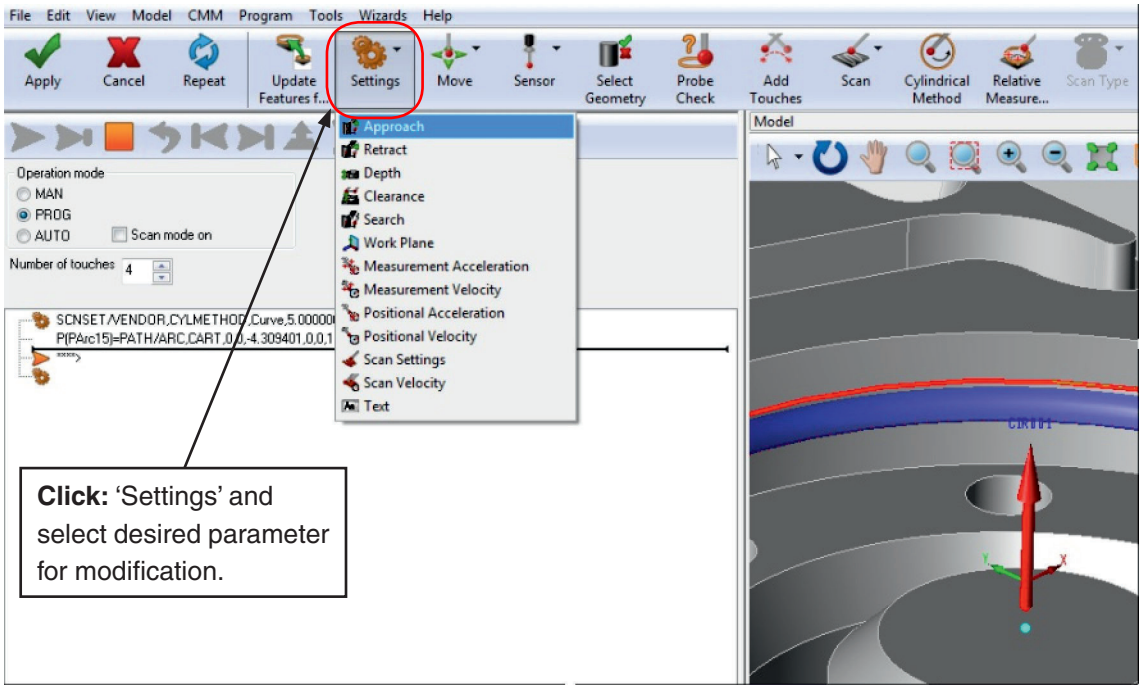
Select: ‘Scan Circle Path’.



Input required depth from feature nominal.

Click: ‘Green Tick’ to apply.

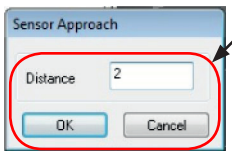
Settings can be changed at this stage if required.



Click: ‘Settings’ and select desired parameter for modification.

In this case ‘Approach’ has been selected. Edit the required value.

Click: ‘OK’ to continue.



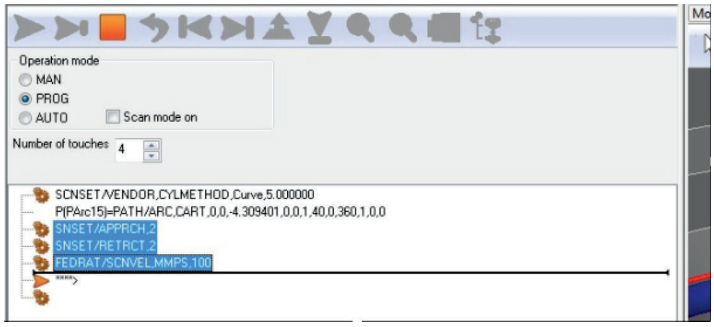
Repeat this process from the ‘Settings’ drop down menu. In the example below the following have been selected:

‘Approach’ - the distance from the surface touch point where the probe path becomes normal to the surface

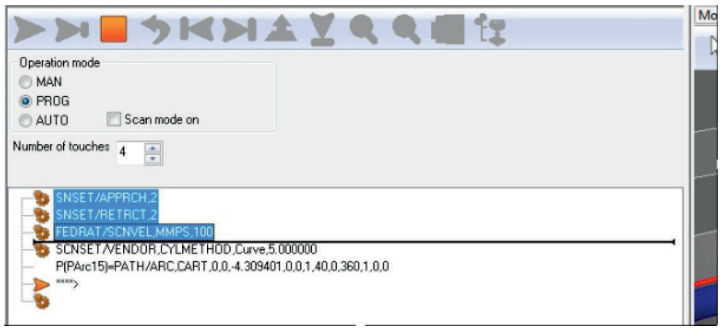
‘Retract’ - distance the probe backs off after a touch has been detected

‘Scan Velocity’ - speed of the probe when scanning along a surface

At this point the parameters have been added to the bottom of the measurement block:



A simple drag and drop can be used to move the parameters to the top of the measurement block so that they will be executed prior to measurement.



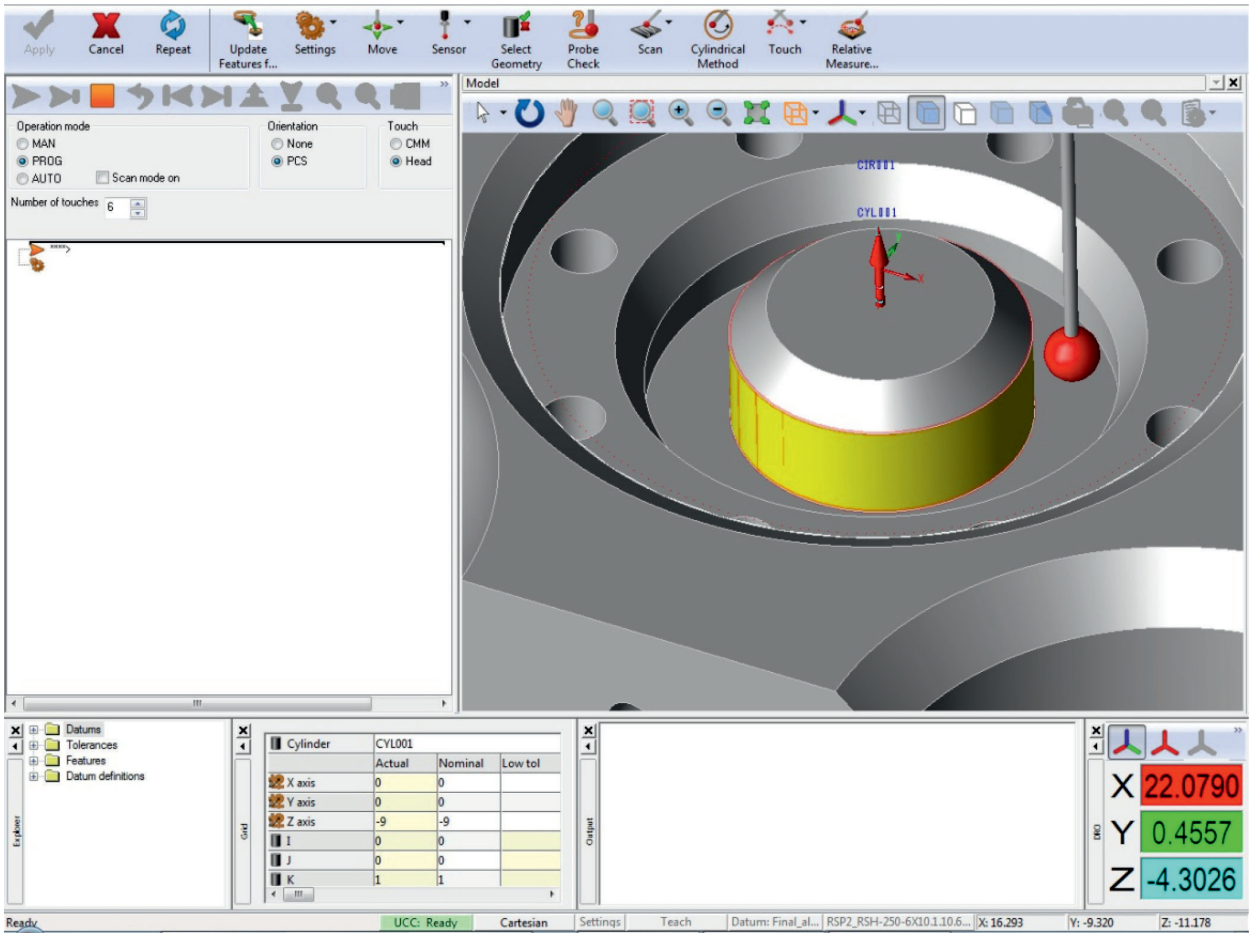
Click: ‘Green Tick’ to apply.

In order to maintain the inputted tilt angle the machine and the probe move to measure the bore resulting in a 5-axis scan. This is predominately relevant when measuring large internal diameters.

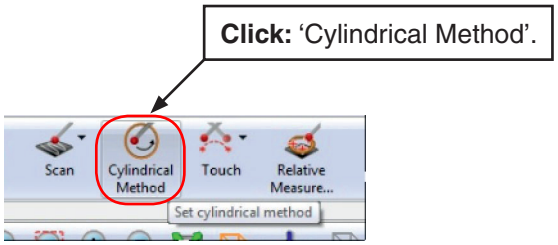
5 Outside diameter cylinder scanning using 5-axis scanning methods

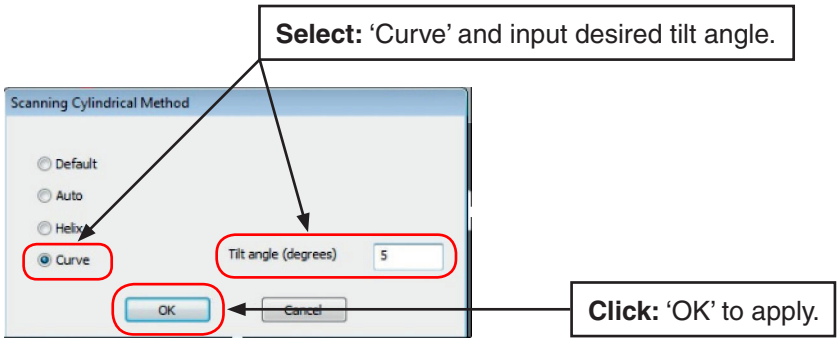
The outside diameter of the central boss on the Renishaw training block can also be scanned.

Select the boss outside diameter:



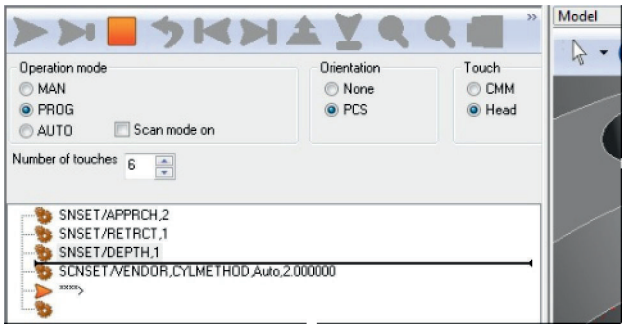
When carrying out this form of scanning, care must be taken to avoid stylus shank collision during the measurement process. This can be done by selecting 'Cylindrical Method' as discussed earlier in this tutorial.

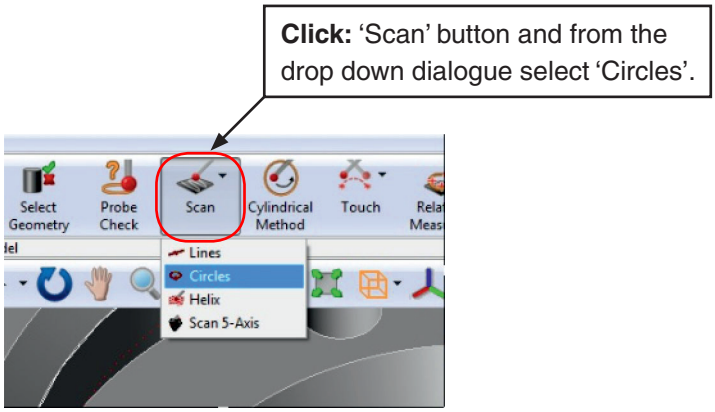




At this point, if required, select required settings.

Using drag and drop function, move the parameters to the top of the measurement block.

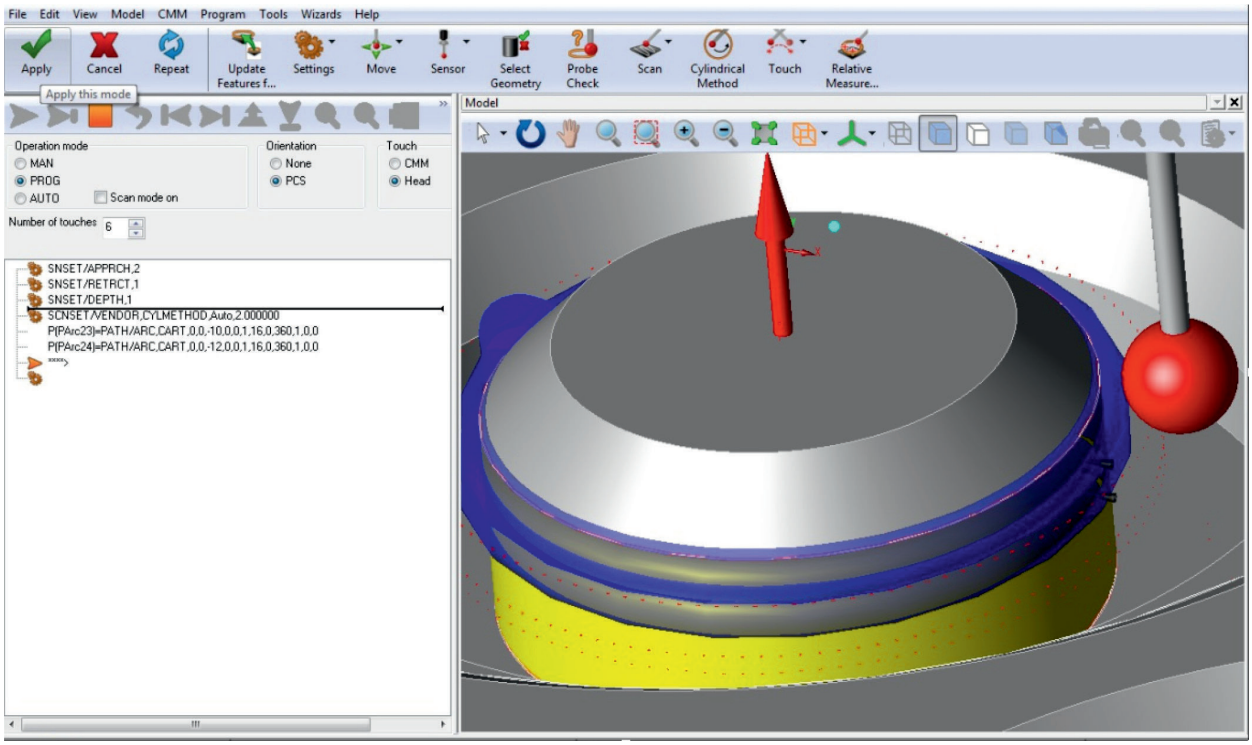




Enter the desired 'Number of Sections' and 'Depth' from feature nominal as required.

Click: 'Green Tick' to apply.

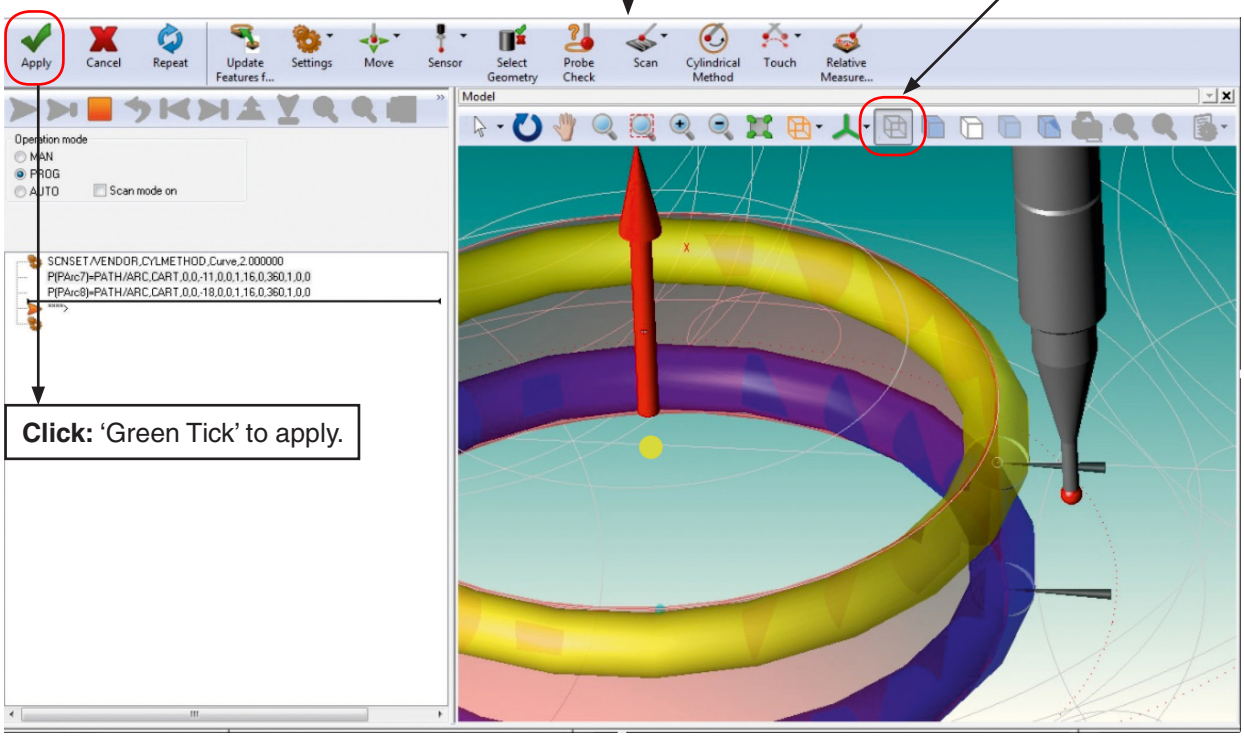
At this point all scan paths can be manipulated as shown previously.



When measuring a cylinder the depth of the paths can also be manipulated. In this example, 'Wire Frame' is selected to enable viewing of the depth handle.

Select required path in 'Teach Path View', then click on depth handle and adjust.

Select: 'Wire Frame'.

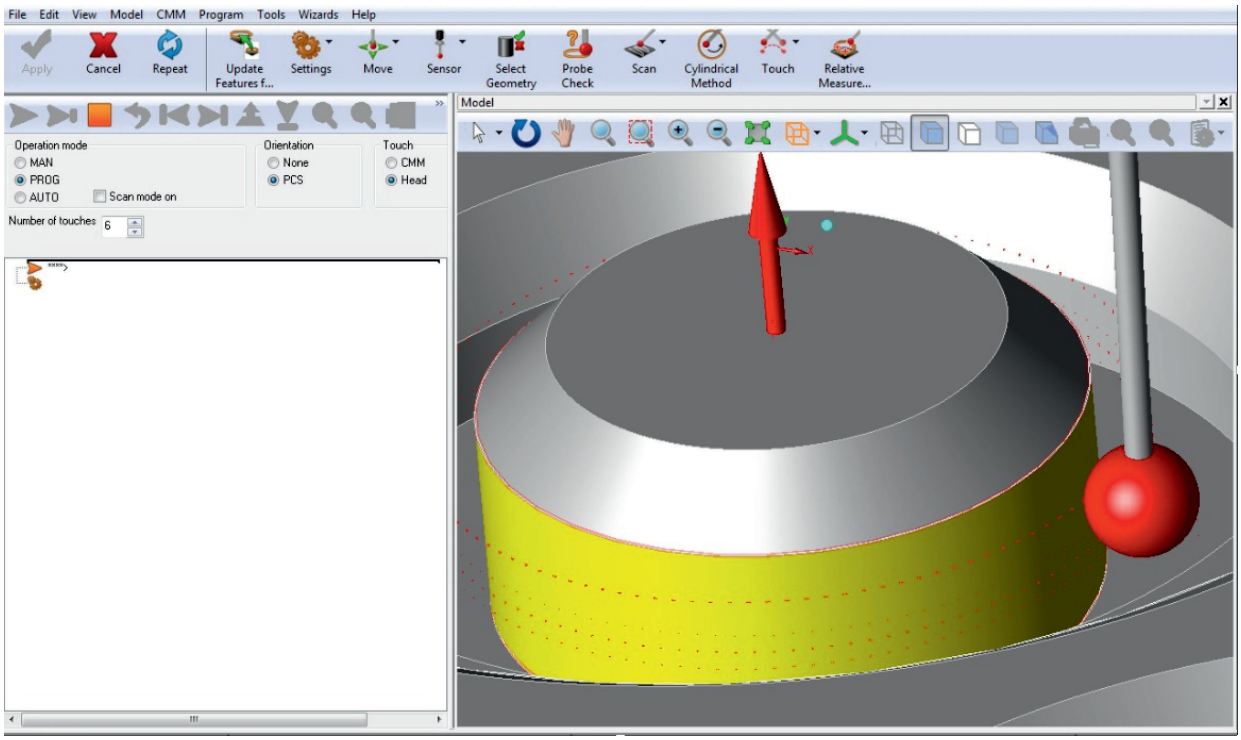


Click: 'Green Tick' to apply.

6 Cylindrical method ‘Helix’ scan of boss

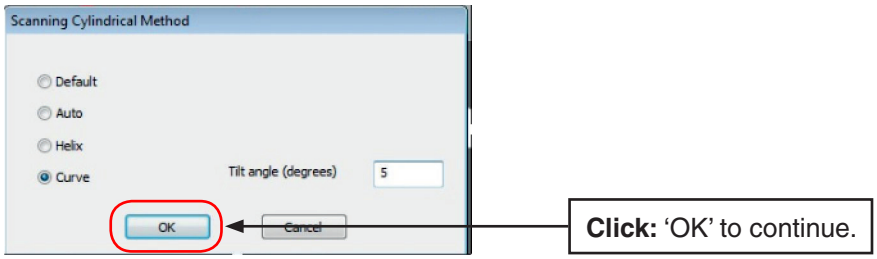
As an alternative to a series of discrete circular scans, helical paths can also be used to scan the outside diameter of the boss.

Select the boss to helix scan:

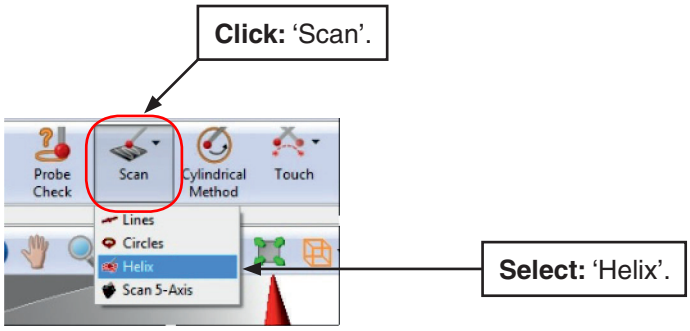


Select: ‘Cylindrical Method’.

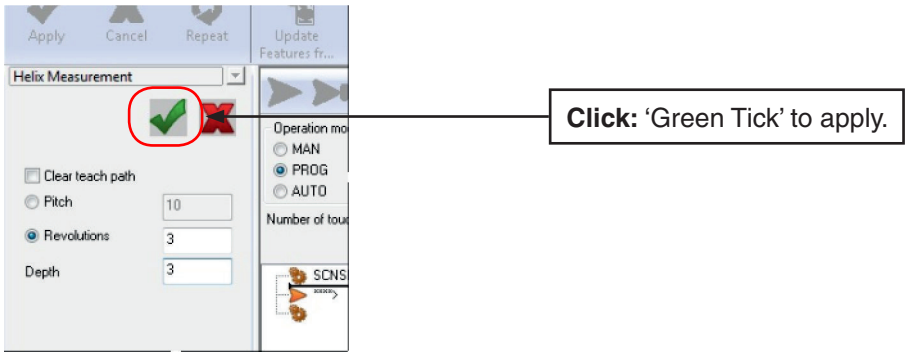
Enter the values in the dialogue box to suit:



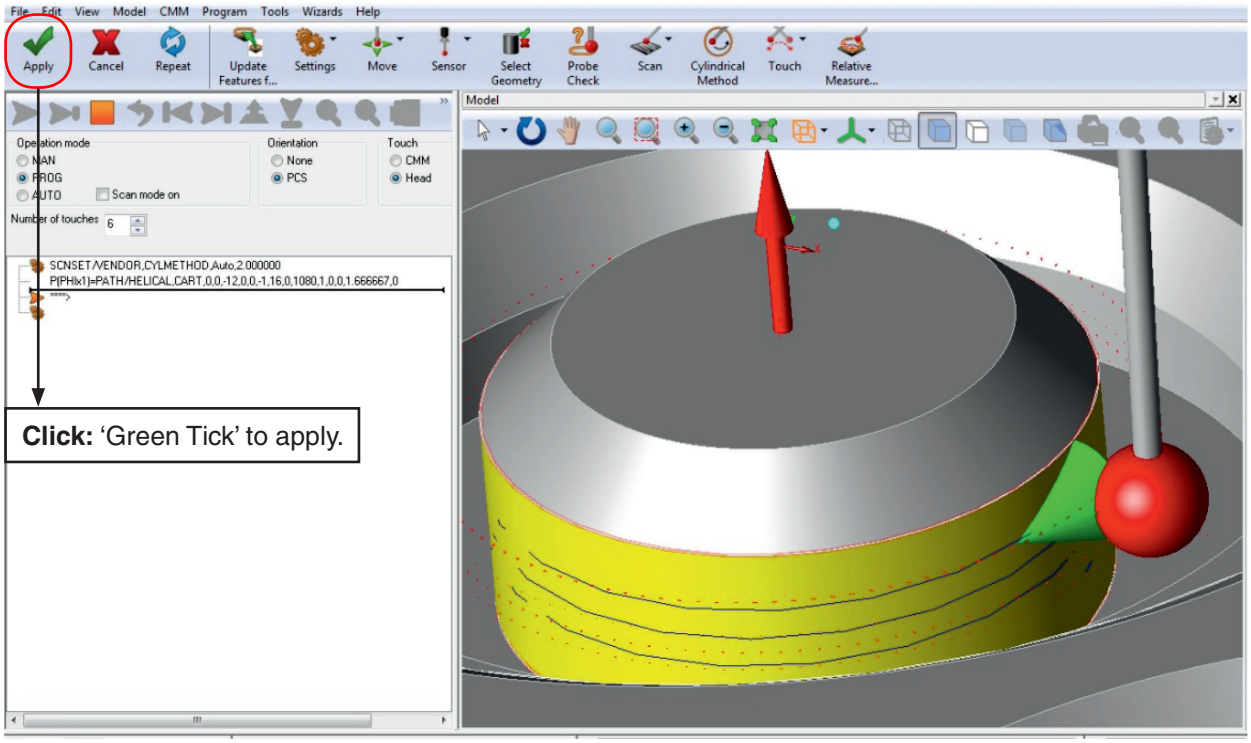
GUIDANCE NOTE: At this point all previous settings (i.e. ‘Approach’, ‘Retract’ etc.) will continue to apply until tools are changed.



Fill in required ‘Helix Measurement’ dialogue:



For further information on ‘Helix Measurement’ refer to MODUS help (F1).



In order to maintain the inputted tilt angle the machine and the probe move to measure the outside diameter resulting in a 5-axis scan.

7 Counter bore face measurement using RSP3

Definition of RSP2 and RSP3

RSP2 - A 2½D probe which can scan in two dimensions with a lateral probe tip deflection.

Touch points can be taken at any angle including along the stylus vector using the internal probe micro switch.

RSP2 enables high-speed, accurate 5-axis scanning with speeds typically up to 500 mm/s.

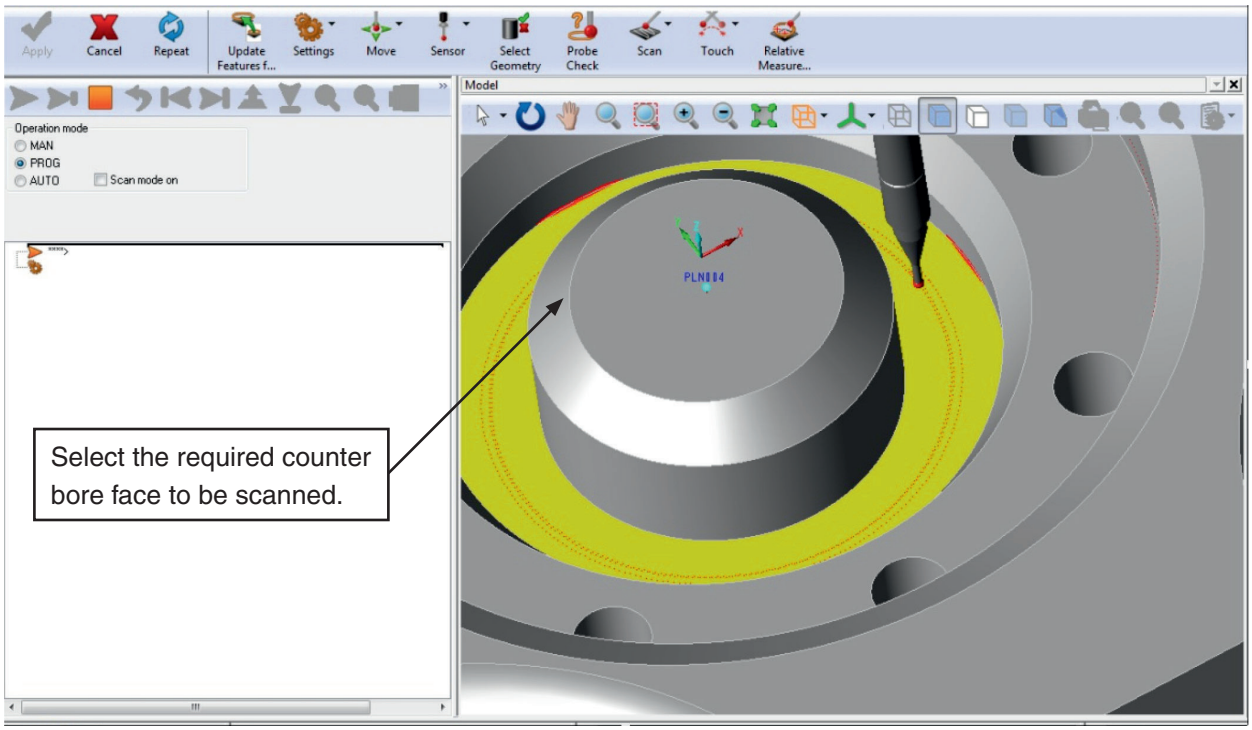
RSP3 - A full 3D probe which can scan and take touch points in all three dimensions.

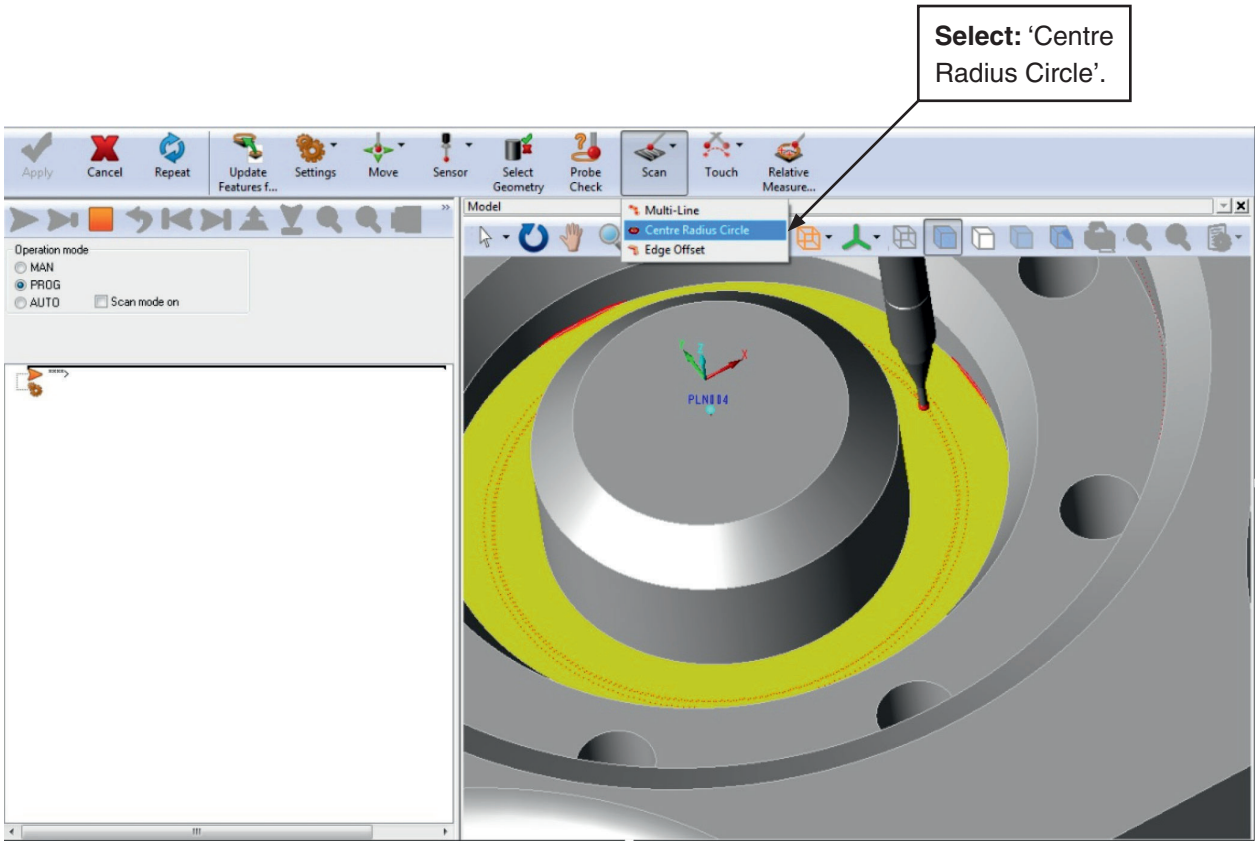
However due to machine dynamics and mass it is restricted to 3-axis scanning with speeds typically up to 20 mm/s.

Due to the speed and efficiency of the RSP2 it should be primarily selected to measure features.

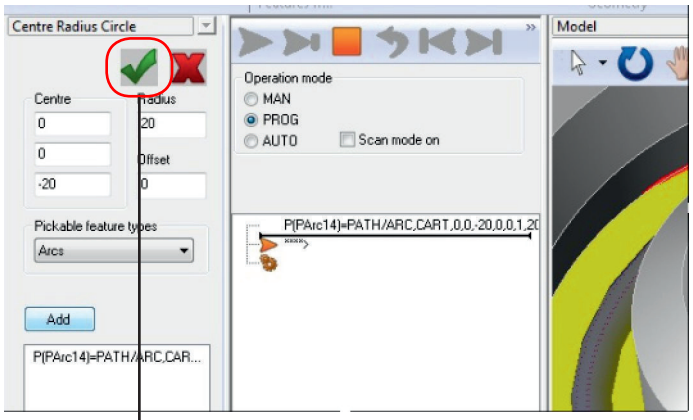
Where the working angle of the RSP2 cannot be achieved due to access restrictions then an RSP3 must be used. The counterbore face of the training block is an example of this.

Select and set RSP3 as previously created in ‘Creation of multiple tools RSP2 and RSP3 (phase 2)’.



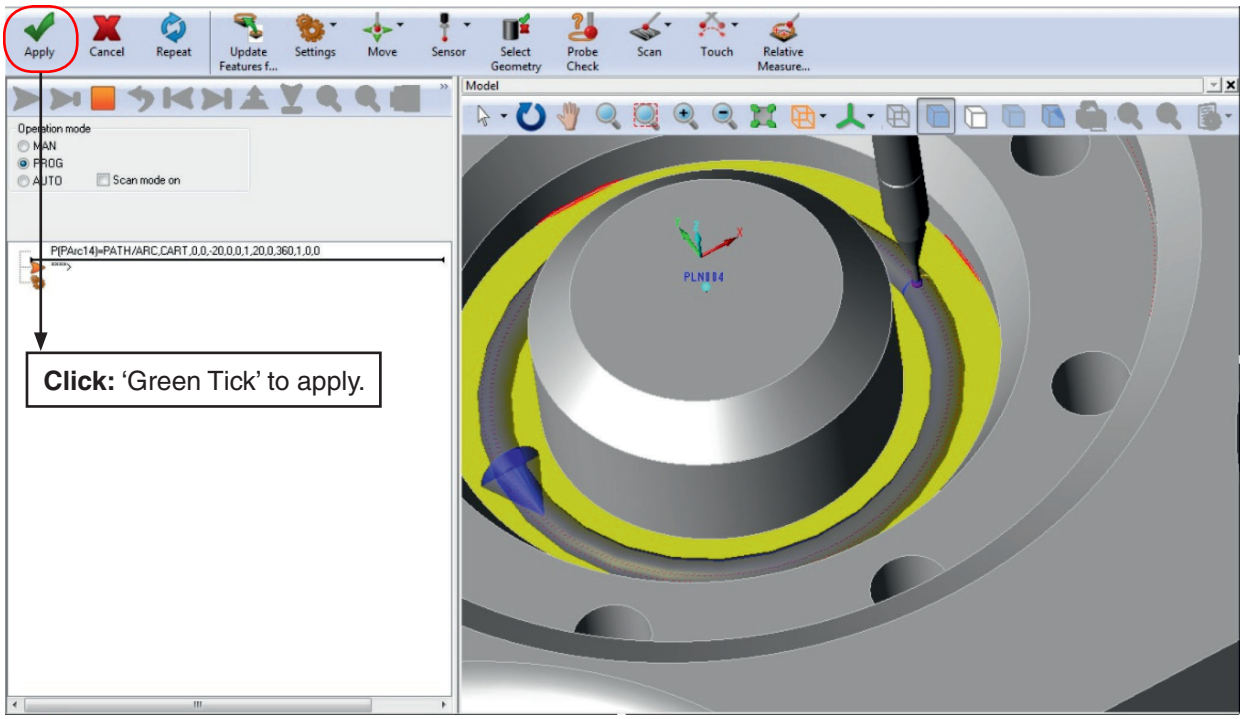


Within the 'Centre Radius Circle' dialogue, input the radius of the required scan:



Click: 'Green Tick' to apply.

At this point, manipulate the scan path as previously mentioned.



The machine and the probe move to measure the counterbore face resulting in a 3-axis scan.

Renishaw plc

New Mills, Wotton-under-Edge,
Gloucestershire, GL12 8JR
United Kingdom

T +44 (0)1453 524524
F +44 (0)1453 524901
E uk@renishaw.com

www.renishaw.com

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For worldwide contact details, please visit our main web site at www.renishaw.com/contact

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